Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

1. (Cancelled)

2. (Currently Amended) ~~The~~ A method ~~of claim 1~~, for producing an encoded information signal having attenuated low frequency spectral components and a substantially constant average energy, the method producing an M bit code word for each N bits of the information signal according to the following conditions: (a) each code word includes an equal number of logic zero bits and logic one bits; (b) each code word includes no more than two consecutive identical bits; and (c) M is greater than N wherein the producing an M bit code word for each N bits of the information signal is also according to the following condition: (d) each code word, representative of a particular combination of N bits, is different by at least two bits than any other code word, representative of a different combination of N bits.

3. (Currently Amended) The method of claim ~~1~~ 2, wherein M equals eight and N equals four, and wherein the generating the code words comprises producing an eight bit code for each four bits of the information signal.

4. (Currently Amended) The method of claim ~~1~~ 2, further comprising generating frames having an equal number of logic zero bits and logic one bits in each pair of consecutive frames

by producing a header for each predetermined number of codes according to the following conditions (i) each header is different from any of the generated code words by at least two bits; and (ii) each header is a compliment of any immediately preceding header and any immediately following header.

5. (Original) The method of claim 4, wherein M equals eight and N equals four, and wherein the generating the code words comprises producing an eight bit code for each four bits of the information signal.

6. (Currently Amended) The method of claim ~~1~~ 2, further comprising generating frames having an equal number of logic zero bits and logic one bits in each pair of consecutive frames by producing a header for each predetermined number of code words according to the following conditions (i) each header is different from any of the generated code words by at least two bits; (ii) each header is a compliment of any immediately preceding header and any immediately following header; and (iii) each header is different from any possible contiguous M bits of any possible pair of consecutive code words by at least one bit.

7. (Original) The method of claim 6, wherein M equals eight and N equals four, and wherein the generating the code words comprises producing an eight bit code for each four bits of the information signal.

8. (Original) A method for generating a magnetic field signal usable for locating an

underground object, comprising: (a) generating a reference signal having a reference signal frequency substantially equal to the integer multiple of 300 Hz; (b) receiving an information signal; (c) encoding the information signal to produce an encoded information signal meeting the following conditions (c.1) each code word includes an equal number of logic zero bits and logic one bits, and (c.2) each code word includes no more than two consecutive identical bits; and (d) modulating the reference signal with the encoded information signal at a predetermined bit rate to produce a drive signal including (d.1) a carrier component having a carrier component frequency equal to the reference signal frequency and a substantially constant average energy, and (d.2) at least one information sideband including sideband energy, the encoding and bit rate causing a substantial portion of the sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz from the carrier component frequency; and (f) driving a transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having a magnetic field signal carrier component having a frequency equal to the carrier component frequency and at least one magnetic field signal information sideband including magnetic field signal sideband energy, a substantial portion of the magnetic field signal sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz from the carrier component frequency.

9. (Original) The method of claim 8, wherein the encoding in step (c) also meets the following condition: (c.3) each code word, representative of a particular combination of bits, is different by at least two bits from any other code word, representative of a different combination of bits.

10. (Original) The method of claim 8, wherein the predetermined bit rate is between 50 and 80 bits per second, and step (d) comprises modulating the reference signal with the encoded information signal at the bit rate between 50 and 80 bits per second.

11. (Original) The method of claim 10, wherein the predetermined bit rate is 75 bits per second and step (d) comprises modulating the reference signal with the encoded information signal at the bit rate of 75 bits per second.

12. (Original) The method of claim 11, wherein step (c) comprises encoding the information signal by producing an eight bit code word for each four bits of the information signal to thereby produce the encoded information signal.

13. (Original) The method of claim 12, wherein the producing an eight bit code word for each four bits of the information signal comprises selecting one of sixteen different predetermined eight bit code words for each four bits of the information signal, and wherein: each of the sixteen eight bit code words is representative of a different combination of four bits; each of the sixteen code words includes an equal number of logic zero bits and logic one bits; and each of the sixteen code words includes no more than two consecutive identical bits.

14. (Original) The method of claim 13, wherein each of the sixteen eight bit code words is different from any of the other eight bit code words by at least two bits.

15. (Original) The method of claim 14, wherein step (c) further comprises producing a header for each predetermined number of eight bit code words, to thereby produce frames of the encoded information signal.

16. (Original) The method of claim 14, wherein step (c) further comprises producing a header for each predetermined number of eight bit code words to meet the following conditions: (c.3) each header is different from any of the generated code words by at least two bits, and (c.4) each header is a compliment of any immediately preceding header and any immediately following header.

17. (Original) The method of claim 14, wherein step (c) further comprises producing a header for each predetermined number of eight bit code words to meet the following conditions: (c.3) each header is different from any of the generated code words by at least two bits, (c.4) each header is a compliment of any immediately preceding header and any immediately following header, and (c.5) each header is different from any possible contiguous eight bits of any possible pair of consecutive code words by at least one bit.

18. (Original) The method of claim 8, wherein step (c) comprises encoding the information signal by producing a code word for each predetermined number of bits of the information signal to thereby produce the encoded information signal.

19. (Original) The method of claim 18, wherein the producing the code word for each predetermined number of bits of the information signal comprises selecting one of a plurality of different code words for each predetermined number of bits of the information signal, and wherein: each of the plurality of code words is representative of a different combination of the predetermined number of bits; each of the plurality of code words includes an equal number of logic zero bits and logic one bits; and each of the plurality of code words includes no more than a predetermined number of consecutive identical bits.

20. (Currently Amended) The method of claim ~~28~~ 18, wherein step (c) further comprises producing a header for each predetermined number of code words, to thereby produce frames of the encoded information signal.

21. (Original) The method of claim 20, wherein step (c) comprises producing the header for each predetermined number of code words to meet the following conditions: (c.3) each header is different from any of the generated code words by at least two bits, and (c.4) each header is a compliment of any immediately preceding header and any immediately following header.

22. (Original) The method of claim 20, wherein step (c) comprises producing the header for each predetermined number of code words to meet the following conditions: (c.3) each header is different from any of the generated code words by at least two bits, (c.4) each header is a compliment of any immediately preceding header and any immediately following header, and

(c.5) each header is different from any possible contiguous bits of any possible pair of consecutive code words by at least one bit.

23. (Original) An encoder to produce an encoded information signal including attenuated low frequency components and a substantially constant average energy, the encoder comprising: code storing means for storing a plurality of different codes words each representative of a different combination of N bits, wherein each of the plurality of different code words meet the following conditions: (a) each code word includes an equal number of logic zero bits and logic one bits; and (b) each code word includes no more than two consecutive identical bits; and selecting means for selecting one of the plurality of different code words for each N bits of the information signal.

24. (Original) The encoder of claim 23, wherein the storing means comprises a lookup table.

25. (Original) The encoder of claim 23, wherein the storing means comprises memory.

26. (Original) The encoder of claim 23, each of the plurality of different code words also meet the following conditions: (c) each code word, representative of a particular combination of N bits, is different by at least two bits than any other code word, representative of a different combination of N bits.

27. (Original) The encoder of claim 23, wherein N equals four, and each of the plurality of different code words comprises an eight bit code word.

28. (Original) The encoder of claim 23, further comprising: a header storing means for storing a first header and a second header, wherein the second header is a complement of the first header, wherein each of the first and second headers are different from any of the plurality of code words by at least two bits, and wherein each header is different from any possible contiguous bits of any possible pair of consecutive code words by at least one bit; and a header insertions means for inserting one of the first and second headers between each predetermined number of code words selected by the selecting means to thereby produce frames.

29. (Original) The encoder of claim 23, wherein the header insertions means alternates between inserting the first header and the second header so that any pair of consecutive frames includes a first header and a second header.

30. (Original) A system for generating a magnetic field signal usable for locating an underground object, comprising: a reference signal generator to produce a reference signal having a reference signal frequency substantially equal to the integer multiple of 300 Hz; an encoder to encode an information signal to produce an encoded information signal meeting the following conditions (a.1) each code word includes an equal number of logic zero bits and logic one bits, and (a.2) each code word includes no more than two consecutive identical bits; a modulator to modulate the reference signal with the encoded information signal at a

predetermined bit rate to produce a drive signal including (b.1) a carrier component having a carrier component frequency equal to the reference signal frequency, and (b.2) at least one information sideband including sideband energy, the encoding and bit rate causing a substantial portion of the sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz from the carrier component frequency; and a transponder to generate the magnetic field signal when driven by the drive signal, the magnetic field signal having a magnetic field signal carrier component having a frequency equal to the carrier component frequency and at least one magnetic field signal information sideband including magnetic field signal sideband energy, a substantial portion of the magnetic field signal sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz from the carrier component frequency.

31. (Original) The system of claim 30, wherein the encoder encodes the information signal to produce the encoded information signal also meeting the following condition (a.3) each code word is different from each other code word by at least two bits.

32. (Original) The system of claim 30, wherein the encoder produces an eight bit code word for each four bits of the information signal to thereby produce the encoded information signal.

33. (Original) The system of claim 30, wherein the encoder produces an eight bit code word for each four bits of the information signal, and produces a header for each predetermined

number of eight bit code words to thereby produce frames of the encoded information signal.

34. (Original) The system of claim 33, wherein the encoder produces the header for each predetermined number of eight bit code words to meet the following additional conditions (b.3) each header is different from any of the generated code words by at least two bits, and (b.4) each header is a compliment of any immediately preceding header and any immediately following header.

35. (Original) The system of claim 33, wherein the encoder produces the header for each predetermined number of eight bit code words to meet the following additional conditions (b.3) each header is different from any of the generated code words by at least two bits, (b.4) each header is a compliment of any immediately preceding header and any immediately following header, and (b.5) each header is different from any possible contiguous eight bits of any possible pair of consecutive code words by at least one bit.

36. (Original) The system of claim 30, wherein the encoder produces the header for each predetermined number of code words to meet the following additional conditions (b.3) each header is different from any of the generated code words by at least two bits, and (b.4) each header is a compliment of any immediately preceding header and any immediately following header.

37. (Original) The system of claim 30, wherein the encoder produces the header for each

predetermined number of code words to meet the following additional conditions (b.3) each header is different from any of the generated code words by at least two bits, (b.4) each header is a compliment of any immediately preceding header and any immediately following header, and (b.5) each header is different from any possible contiguous bits of any possible pair of consecutive code words by at least one bit.

38. (Original) A method for encoding data, comprising the steps of: (a) encoding each four bits of the data into an eight bit code word that is representative of the respective four bits, wherein each eight bit code word includes an equal number of logic one bits and logic zero bits; (b) grouping a first plurality of the eight bit code words into a first group and a second plurality of the eight bit code words into a second group; and (c) adding a first header to the first group to produce a first frame and a second header to the second group to produce a second frame, wherein each header comprises an eight bit header code that is different from any of the eight bit data codes in its respective frame, and wherein the second header is a compliment of the first header, whereby a total bits of the first and second frames together include an equal number of logic one bits and logic zero bits.

39. (Original) The method of claim 38, wherein no more than two consecutive bits of each eight bit code word are identical.

40. (Original) The method of claim 38, wherein each eight bit code word, representative of a particular combination of four bits, is different by at least two bits from each other eight bit

code word, representative of a different combination of four bits.

41. (Original) The method of claim 40, further comprising the following step prior to step (a): storing sixteen separate eight bit code words, wherein each eight bit code word is representative of four bits of data, includes an equal number of logic one bits and logic zero bits, includes no more than two consecutive identical bits, and is different from each other code word by at least two bits.

42. (Original) The method of claim 40, wherein step (a) comprises encoding each four bits of the data by selecting a representative one of the sixteen separate eight bit code words for each four bits of data.

43. (Original) A method for producing a magnetic field signal, comprising: (a) encoding an information signal to produce an encoded information signal having attenuated low frequency spectral components and a substantially constant average signal energy; (b) modulating a reference signal with the encoded information signal at a predetermined bit rate to produce a drive signal including (b.1) a carrier component having a substantially constant average energy and a carrier component frequency equal to the reference signal frequency, and (b.2) at least one information sideband including sideband energy, the encoding and bit rate causing a substantial portion of the sideband energy to be contained between the carrier component frequency and a frequency spaced 50 Hz from the carrier component frequency; and (c) driving a transponder with the drive signal to generate the magnetic field signal, the magnetic field signal having a

magnetic field signal carrier component and at least one magnetic field signal information sideband, wherein the magnetic field signal carrier component has a substantially constant average energy and a frequency equal to the carrier component frequency, and wherein the at least one magnetic field signal information sideband includes magnetic field signal sideband energy, a substantial portion of the magnetic field signal sideband energy contained between the carrier component frequency and the frequency spaced 50 Hz from the carrier component frequency.